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Electoral terms and terrorism

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Abstract Many terror attacks occur at the beginning of electoral terms. We present a game theoretical model with incomplete information to account for this empirical pattern. Both terrorists and governments can be of weak or strong types. We find that the risk of terror attacks is highest at the beginning of electoral terms, because striking early allows the terrorists to collect valuable information about the government's type, and also because terrorists know that even initially weak governments sometimes retaliate to show toughness closer to an upcoming election. The model's predictions are consistent with anecdotal evidence.

Keywords Terrorism · Tenure · Elections · Reputation

JEL Classification C72 · D74

1 Introduction

Many terror attacks occur shortly after a new cabinet enters into office, while the middle of electoral terms is usually characterized by less terrorism.[1] Famous examples of attacks early in electoral terms include the 9/11 attacks in 2001 in New York and Washington, DC,

[1] While in the middle of electoral terms the likelihood of terror attacks seems low, this probability could rise again right before new elections. Such attacks may be motivated by the desire to affect electoral outcomes. As this mechanism has already received quite some attention in the literature (see below), we focus mostly on the differences between the beginning and middle of electoral terms, but will still study the government's electoral motives in an extension.

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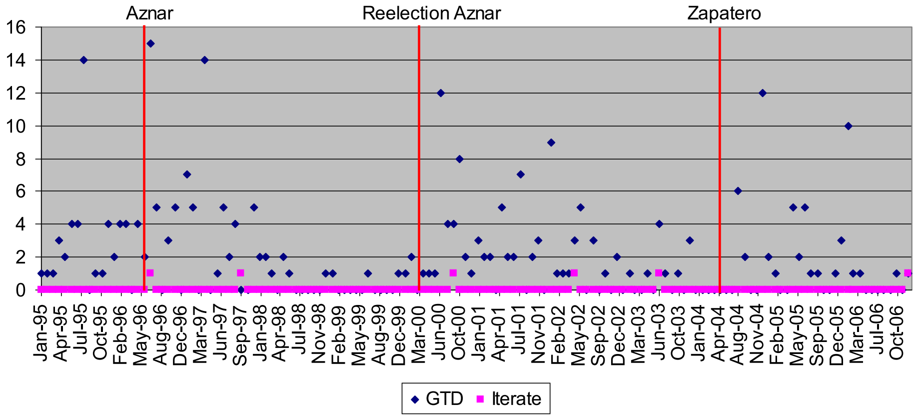

Fig. 1 ETA terror incidents and elections in Spain

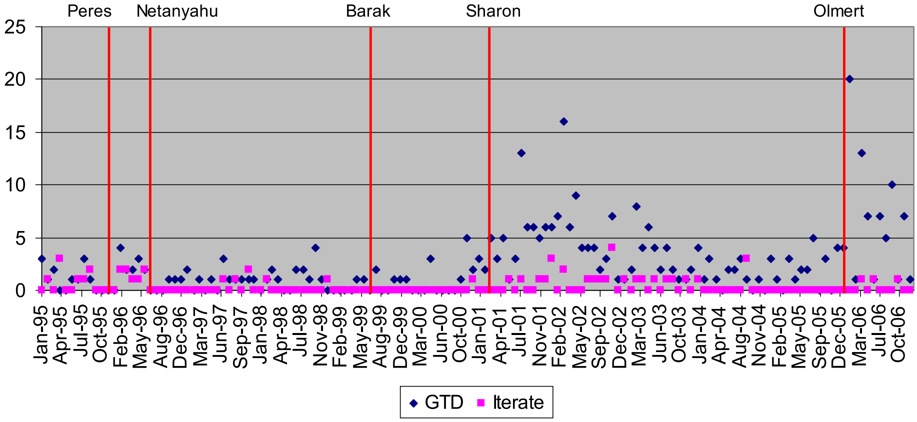

Fig. 2 Terror incidents and elections in Israel

eight months after George W. Bush moved into the White House, and the 7/7 bombings in London in 2005, one month after Labour's electoral victory.[2] Also the Beslan school hostage crisis in September 2004 occurred shortly after the beginning of Vladimir Putin's second electoral term, while the Paris metro bombing in July 1995 took place two months after Jacques Chirac was elected French president. Similarly, Al-Qaeda's attempts to explode a plane from Amsterdam to Detroit in December 2009 and to detonate a car bomb on Times Square in New York City in May 2010 occurred early in Barak Obama's presidency.

This pattern becomes also apparent from Fig. 1 which displays ETA terrorism in Spain, using data from the Global Terrorism Dataset (GTD 2009) and ITERATE (Mickolous et al. 2007) and covering the period from January 1995 to December 2006. During this period, three elections took place. ETA terror attacks tend to surge after the elections, when a new government or a new cabinet enters office. The situation is similar for Israel, as displayed in Fig. 2 (using again data from GTD and ITERATE for the same time period). In Israel

[2] Although Tony Blair remained Prime Minister, the start in office of a new cabinet represents at least partially a new beginning, given that the effective power structures and constraints change after each election.

terrorism tends to surge as well at the beginning of electoral terms, especially in the case of Ariel Sharon's and Ehud Olmert's entry in office.

In the present paper we want to explain this empirical pattern using a game theoretical model with incomplete information about the types of governments and terrorists. This model predicts that attacks are more likely earlier in an electoral term. Early attacks lead to greater benefits for the terrorists as they help to acquire valuable information about the government's type, i.e., about how inclined the government is to fight terrorism. An extended version of the model further shows that early attacks are more likely also because even initially weak governments may sometimes react aggressively to attacks later in their terms to show toughness to the voters.

In recent years there has been a growing literature on terrorism (see, e.g., Krueger and Maleckova 2003; Kurrild-Klitgaard et al. 2006; Enders and Sandler 2006; Shughart 2006; Rohner and Frey 2007; Azam and Thelen 2008; Frey et al. 2009; Krieger and Meierrieks 2010; Basuchoudhary and Shughart 2010). Only a few contributions, however, link terrorism to elections or government characteristics. Berrebi and Klor (2006), Bali (2007), Gassebner et al. (2008) and Montalvo (2010) study how terrorist attacks affect electoral outcomes.[3]

Bueno de Mesquita (2005) analyzes how governments can affect the level of moderation or extremism of terrorist organizations, and Siqueira and Sandler (2007) and Bueno de Mesquita (2007) show that elections can result in too few (proactive) countermeasures against terrorism. Pape (2003) argues that suicide terrorism is motivated by the willingness to obtain (territorial) concessions, and finds that democracies—which are viewed as "soft"—are more likely to become targets. In Frey and Rohner (2007) and Crettez and Deloche (2010) governments can signal determination by committing to reconstruct destroyed cultural monuments.

While these contributions link government behavior and terrorism, the timing of terror attacks is an issue that has been largely ignored. One exception is the empirical study of ETA terrorist attacks by Barros et al. (2006), who find that ETA attacks increase in summer, but decrease with deterrence, repressive political governments, and political accords. To the best of our knowledge, the question why more terror attacks tend to occur shortly *after* elections rather than later in the electoral term has not yet received any attention.

Methodologically, our framework builds on earlier work on reputation and imperfect information by Kreps and Wilson (1982), and its application to protests by Buenrostro et al. (2007). But while these contributions assume that there is a new potential attacker (e.g., a new potential entrant or a new protest group) in every period, we assume that the *same* terrorists can attack repeatedly.

The remainder of this paper is organized as follows: The model is presented in Sect. 2 and solved in Sect. 3. Section 4 extends the framework to account for electoral motives of the government. Section 5 discusses the results, and Sect. 6 concludes.

2 The model

There are two players, the government G and the terrorists T. Each player is either weak (w) or strong (s). Hence, $G \in \{G^w, G^s\}$ and $T \in \{T^w, T^s\}$. The probability that the government is strong is $\alpha \in (0, 1)$; and the probability that the terrorists are strong is $\beta \in (0, 1)$. The

[3] Karol and Miguel (2007) show that the US casualties in Iraq negatively affected the votes obtained by George W. Bush in 2004.

types of G and T are independently drawn. Each player can observe only their own type, but α and β are common knowledge.

The game lasts for two periods, the first one representing the beginning of the government's term and the second one later in the term. In each period $t \in \{1, 2\}$, a sequential game is played. The terrorists move first and choose between attacking (a) and not attacking (n). When they attack, the government has the choice between defending/retaliating (d) and not retaliating (c). When they do not attack, the government does not move in the given period.

Net payoffs (total gains minus costs) are as follows: Terrorists of type $T^w(T^s)$ get 0 if they do not attack; $A^w(A^s)$ if they attack and the government does not retaliate; and $B^w(B^s)$ if they attack and the government defends. We assume $A^s > B^s > 0$ and $A^w > 0 > B^w$. These assumptions imply that all terrorists benefit if the government does not retaliate, e.g., because they are motivated by political (or territorial) concessions. Strong and weak terrorists however differ in that strong terrorists benefit from attacks even when the government defends, e.g., because they use terror attacks to increase support for their cause, while for weak terrorists the costs outweigh the benefits of a terror attack when the government defends.[4] A government of type $G^w(G^s)$ gets 0 in the absence of an attack; $C^w(C^s)$ if there is an attack and it does not retaliate; and $D^w(D^s)$ if there is an attack and it defends. We assume $0 > D^s > C^s$ and $0 > C^w > 2C^w > D^w$. These assumptions imply that the government always suffers when attacked. A strong government, however, is better off retaliating than not retaliating, while retaliating is considerably more costly than not retaliating for a weak government. For simplicity we abstract from discounting. To illustrate the game, we show the game tree for period one in Fig. 3, where N stands for Nature, and where dotted lines connect decision nodes that are in the same information set.

The solution concept employed is Perfect Bayesian Equilibrium (PBE). We denote by μ_α the terrorists' beliefs that the government is strong, and by μ_β the government's beliefs that the terrorists are strong. The optimal strategies of strong terrorists and a strong government are independent of their beliefs: Strong terrorists always attack, and a strong government always defends. Hence we focus on the equilibrium strategies of weak terrorists and a weak government.[5] We thereby assume that weak terrorists attack when indifferent, and that a weak government defends when indifferent.[6]

3 The equilibrium

We solve the model through backward induction and first analyze the period two subgame:

Lemma 1 *In period two, a weak government does not retaliate when attacked, and weak terrorists attack if and only if $\mu_\alpha \leq \theta$, where $\theta \equiv \frac{A^w}{A^w - B^w} \in (0, 1)$.*

Proof It follows from $C^w > D^w$ that G^w plays c when T plays a in $t = 2$. T^w's expected payoff in $t = 2$ is thus $\mu_\alpha B^w + (1 - \mu_\alpha)A^w$ when playing a, and 0 when playing n. Hence

[4] See, e.g., Pape (2003), Rohner and Frey (2007), and Gould and Klor (2010) for an assessment of the motivations of terrorists and their gains from attacks.

[5] By focusing on the weak types, we follow Kreps and Wilson (1982) and Buenrostro et al. (2007).

[6] These tie-breaking rules ease the exposition by excluding mixed strategy equilibria. In Appendix B we drop these tie-breaking rules, and we show that there still exists no PBE in which a weak government mixes between retaliating and not retaliating, and that PBE in which weak terrorists mix between attacking and not attacking are non-generic.

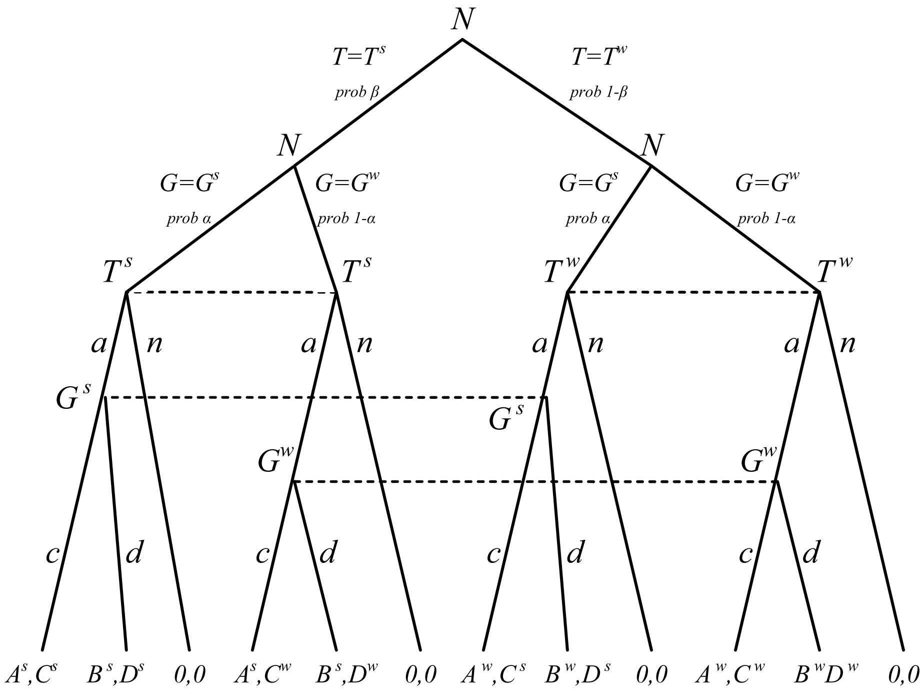

Fig. 3 Game tree for period $t = 1$

T^w plays a if and only if $\mu_\alpha B^w + (1-\mu_\alpha)A^w \geq 0 \Leftrightarrow \mu_\alpha \leq \theta$. It follows from $A^w > 0 > B^w$ that $\theta \in (0, 1)$. $\square$

Lemma 1 implies that a weak government has no incentive to defend in the absence of strategic motives, and that weak terrorists attack in period two if and only if they believe that it is relatively likely that the government is weak.

Next, we analyze the whole two-period game. We start with a negative result:

Proposition 1 *There exists no PBE in which a weak government defends when attacked in period one.*

Proof Suppose there were such a PBE. Then T^w would play n in $t = 1$ because $0 > B^w$, and G^w's strategy in $t = 2$ is independent of its belief μ_β (see Lemma 1), and T^w cannot learn G's type by playing a. Hence, when a is played in $t = 1$, G's belief is $\mu_\beta = 1$. But given this belief, G^w does not want to play d because $C^w > D^w$, and because T^s plays a anyway in $t = 2$. $\square$

Proposition 1 implies that reputational concerns cannot lead a weak government to feign strength. A weak government has no incentive to bluff and to defend when attacked early in its electoral term, because it knows that only strong terrorists would attack in this case, and because strong terrorists attack anyway again later in the term. This proposition is in stark contrast to the results in Kreps and Wilson (1982) and Buenrostro et al. (2007), where a weak monopolist or a weak government may feign strength. This difference arises because the same terrorists can decide repeatedly to attack in our model, while Kreps and Wilson (1982) and Buenrostro et al. (2007) assume that there are different potential entrants and protestants in every period. It follows from their analysis that a weak government may also make a show of strength in our model if tomorrow's terrorists are likely to be weak even when today's terrorists are strong.

We now turn to our main result:

Proposition 2 *There exist the following PBEs*:

(*i*) *If* $\alpha \leq \psi$, *where* $\psi \equiv \frac{2A^w}{2A^w - B^w} \in (0, 1)$, *weak terrorists attack in period one*, *and a weak government does not retaliate in any periods when attacked. Weak terrorists attack again in period two if and only if the government did not retaliate in period one*.

(*ii*) *If* $\alpha > \psi$, *weak terrorists do not attack in any period*, *and a weak government does not retaliate in any periods when attacked.*

There does not exist any other PBE.

Proof See Appendix A. □

Proposition 2 suggests that weak terrorists, knowing that a weak government will not retaliate, attack in period one only if the government is sufficiently likely to be weak. There are two reasons why it is worthwhile for them to launch an attack. First, they may well obtain political concessions from a government that does not retaliate. Second, they will learn the government's type, which is valuable information. Later in the term, they will attack again only if the government did not retaliate (thereby revealing its weak type). But if the government showed strength by defending, weak terrorists prefer not to "provoke" the government and refrain from future attacks.

It follows from Propositions 1 and 2 that:

Corollary 1 *The ex ante probability of a terror attack is in any PBE weakly higher in period one than in period two*.

Proof If $\alpha \leq \psi$, the ex ante probability of an attack is 1 in $t = 1$ and $\beta + (1 - \beta)(1 - \alpha) < 1$ in $t = 2$. If $\alpha > \psi$, the ex ante probability of an attack is β in both $t = 1$ and $t = 2$. □

Hence our model predicts that terrorists have incentives to attack early in the electoral term, which is in line with the anecdotal evidence discussed in the introduction. By striking early, terrorists can gain valuable information about the government's actions in future periods. The terrorists' ability to select their utility-maximizing action in the second period thus provides them with informational rents.

4 Extension of the model

In the baseline version of our model we assume that the government's payoffs are the same in both periods. However, in some cases one could imagine that governments which run for reelection face different incentives later in their electoral term than early on. Our baseline model may thus best capture situations in which the incumbent government cannot run for reelection, e.g., because of binding term limits; or in which it is commonly known that the government's stance on terrorism will not be decisive in the upcoming election.

In this section we study an extended version of our model in which the upcoming election *could* change the incentive structure that the incumbent government faces. The situation we have in mind is one in which the outcome of the subsequent election depends on various issues including economic performance, the popularity of the different candidates and the government's stance on terrorism. Early in the electoral term, it is unclear whether the government's stance on terrorism will play a crucial role in this election. Possibly terrorism and the government's response to it become salient issues, so that the incentives faced by an initially weak government may become very similar to the incentives of a strong government (i.e., the pressure of the public opinion may make "toughness" very attractive). But it is also possible that the election outcome will not depend on the government's stance on terrorism, e.g., because the country is in a recession (boom) and the government too unpopular (popular) to hope for (be worried about) reelection. To capture this situation, we assume that at the beginning of period two a government that was weak in period one becomes strong with probability $\gamma \in [0, 1)$ and remains weak with probability $1 - \gamma$. We further assume that this is common knowledge.

Here in this extended version of our model, a government that is weak in period one knows that it could either be weak or strong in period two. Its expected future payoff thus depends on C^s and/or D^s as well as on C^w and/or D^w. To derive the optimal action of a weak government in period one, we must therefore relate C^s and D^s to C^w and D^w. We assume that the government's payoff when not retaliating after an attack is the same independently of its type, i.e., $C^s = C^w$. It then follows from our assumptions in Sect. 3 that $D^s > C^s = C^w > D^w$. Hence the difference between strong and weak governments is that retaliation is less costly for a strong government than it is for a weak government.

It is straightforward to show that Lemma 1, which describes optimal behavior in period two, also holds in this extended version. The terrorists' belief μ_α, however, may be different. Further, it can be easily shown that Proposition 1 still applies. This implies that it must again hold in any PBE that a weak government does not retaliate when attacked in period one.

Proposition 3 *In the extended version of our model, there exist the following PBEs*:

(*i*) *If* $\alpha \leq \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$ *and* $\gamma \leq \theta$, *weak terrorists attack in period one, and a weak government does not retaliate in any period when attacked. Weak terrorists attack again in period two if and only if the government did not retaliate in period one.*

(*ii*) *If* $\alpha > \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$ *and* $\gamma \leq \theta$, *or if* $\alpha > \theta$ *and* $\gamma > \theta$, *weak terrorists do not attack in any period, and a weak government does not retaliate in any period when attacked.*

(*iii*) *If* $\alpha \leq \theta$ *and* $\gamma > \theta$, *weak terrorists attack in period one, but not in period two, and a weak government does not retaliate in any period when attacked.*

There does not exist any other PBE.

Proof See Appendix A. □

Figure 4 illustrates Proposition 3 by displaying the regions of the parameter space within which the three different types of PBEs exist. Note that there is no overlap in these regions. This implies that there exists a unique PBE for any parameter constellation.

Proposition 3 and Fig. 4 show that as long as γ is small, i.e., as long as a weak government is unlikely to become strong, equilibrium behavior remains qualitatively similar as in the baseline version of the model, in which only PBEs of types (i) and (ii) exist. It still holds that if α is small, weak terrorists attack in period one in the hope to get some political concessions, and to gain valuable information about the government's type, so that they

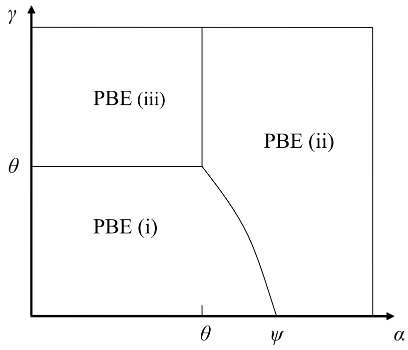

Fig. 4 Regions of the three different types of PBE (for $A^w = -B^w$)

can then attack again if and only if the government is weak. Also, it holds again that weak terrorists do not attack in any period if α is large.

However, if γ becomes sufficiently large, such that an initially weak government is likely to become strong and benefit from defending in response to terror attacks, then weak terrorists will never attack in period two. They may still attack in period one, but the threshold value of α up to which they attack in period one decreases. The reason is that while weak terrorists may still get some political concessions, they no longer benefit from the information they can collect after the attack, as they do not want to attack in period two anyway.

Corollary 2 follows from Propositions 1 and 3:

Corollary 2 *In the extended version of our model, the ex ante probability of a terror attack is still in any PBE weakly greater in period one than in period two.*

Proof If $\alpha \le \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$ and $\gamma \le \theta$, the ex ante probability of an attack is 1 in $t = 1$ and $\beta + (1-\beta)(1-\alpha) < 1$ in $t = 2$. If $\alpha > \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$ and $\gamma \le \theta$, or if $\alpha > \theta$ and $\gamma > \theta$, the ex ante probability of an attack is β in both $t = 1$ and $t = 2$. If $\alpha \le \theta$ and $\gamma > \theta$, the ex ante probability of an attack is 1 in $t = 1$ and $\beta < 1$ in $t = 2$. □

Corollary 2 confirms that the main insight from the baseline version of our model also holds in this extended version. Terror attacks are now more likely at the beginning of an electoral term than later on, not only because there are informational advantages to be gained by attacking early, but also because initially weak governments may sometimes react aggressively to terror attacks later in their terms to show toughness to the voters.

5 Discussion

In this section we briefly discuss how some features of our theoretical model relate to the empirical findings in the literature.

Our model assumes that terrorists are rational and attack only if the expected value of engaging in terrorism is larger than the expected value of abstaining from attacks. This is in line with the evidence presented by Pape (2003) and Gould and Klor (2010). They both find that the use of (suicide) terrorism can help terrorists to obtain concessions.

An important prediction of our model is that when governments show determination and strength in response to terror attacks at the beginning of their electoral term, attacks later in the term become less likely. There is a small empirical literature on whether showing determination and trying to deter terrorists works. This literature offers several key insights: First, protective measures can work, but may lead to substitution. Cauley and Im (1988) and Enders and Sandler (1993) find that installing security measures like metal detectors can reduce future skyjackings, but may make terrorists shift to other forms of attacks.

Second, in countries like Israel where conflict and terror are endemic, it is harder to determine the effects of being tough. Jaeger and Paserman (2008) find that Israeli retaliations to Palestinian terror attacks do not have a statistically significant effect on future terror strikes. In contrast, disaggregating different types of Israeli retaliations, Zussman and Zussman (2006) conclude that Israel's targeted assassinations of senior *military* members of Hamas, Fatah and Islamic Jihad are effective to curb future terrorism, while strikes against senior *political* members of these organizations seems counter-productive. According to Iannaccone and Berman (2006), Berman and Laitin (2008), and Berman (2009) the fact that many targets in Israel are "hard", i.e., difficult to destroy, pushes groups like Hamas towards a strategy of suicide attacks. Further, these authors argue that the weak state in Palestine creates opportunities for groups like Hamas to provide local public goods, which enables them to obtain participation in suicide attacks in exchange for this support.

Third, being weak and making spontaneous, limited concessions (without addressing the main grievances of terrorists) can induce further terror: Barros et al. (2006) find that deterrence and repressive governments let to less ETA terrorist attacks in Spain.[7] Pape (2003: 356) concludes that in the context of suicide terrorism, "almost any concession at all will tend to encourage the terrorist leaders further about their own coercive effectiveness" and hence "homeland security and defensive efforts generally must be a core part of any solution."

For illustration, anecdotal evidence from several of our examples in the introduction supports the view that governments showing determination may be able to reduce the number of attacks until the end of their terms. For example, George W. Bush's "tough" reaction after 9/11—increasing America's defense and national security budgets and starting a global "war on terrorism"—was followed by a period of very few fatal terror acts on U.S. soil until the end of his mandate (as shown by the data from GTD 2009).[8] Also Tony Blair's reaction after the 7/7 bombings in London can be described as "tough", e.g., MI5's funding has about doubled since then (Intelligence and Security Committee 2009). In line with our model there were no more terror fatalities in the United Kingdom until the end of Tony Blair's mandate (as shown by the data from GTD 2009). Vladimir Putin also showed determination in the aftermath of the Beslan school hostage crisis. He even paraphrased Stalin, saying that "[w]e have shown weakness. The weak ones get beaten" (Time Magazine 2004). There were no further major terror attacks in Russia during Putin's time as president.[9]

6 Conclusion

In this paper we have studied how the risk of terror attacks varies over the electoral term. Our model has featured different types of terrorists and governments and has emphasized

[7] Repression also bears risks, especially when human rights are not respected. For example, "in the Algerian War what led—probably more than any other single factor—to the ultimate defeat of France was the realisation, in France and the world at large, that methods of interrogation were being used that had been condemned under the Nazi Occupation" (Horne 2006: 18).

[8] However, while attacks on U.S. soil were deterred, violence surged in other parts of the world.

[9] Note that while our model implies that governments showing toughness may be able to reduce attacks during their terms of office, we do not argue that toughness can guarantee lasting peace.

the impact of imperfect information on the risk of terror strikes. The main result is that the risk of attacks is higher at the beginning of electoral terms than in the middle of them. The two intuitive reasons are that it is often worthwhile for terrorists to strike early in order to obtain valuable information about the type of the government, and also that terrorists know that even initially weak governments sometimes show toughness closer to an upcoming election. We have presented some descriptive evidence that is in line with the predictions of our model.

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Appendix A

In this appendix we prove Propositions 2 and 3. Proposition 2 (which characterizes all PBEs of the baseline version of our model) is a special case of Proposition 3 (which characterizes all PBEs of the extended version), and these two propositions coincide if $\gamma = 0$. To save space, we present the proof of Proposition 3 only.

Proof of Proposition 3 There could potentially exist the following six different types of PBEs in which G^w plays c in any period t in which T plays a:

1. T^w plays a in $t = 1$ and $t = 2$.
2. T^w plays a in $t = 1$ and n in $t = 2$.
3. T^w plays a in $t = 1$, and in $t = 2$ again a if G played d in $t = 1$, but n if G played c.
4. T^w plays a in $t = 1$, and in $t = 2$ again a if G played c in $t = 1$, but n if G played d.
5. T^w plays n in $t = 1$, and a in $t = 2$.
6. T^w plays n in $t = 1$ and $t = 2$.

In a first step we prove that PBEs of type 1, 3 and 5 cannot exist. PBEs of type 1 and 3 require that T^w plays a in $t = 2$ after G played d in $t = 1$. Bayesian updating requires that $\mu_\alpha = 1$ after G played d in $t = 1$, and Lemma 1 implies that T^w plays n in $t = 2$ if $\mu_\alpha = 1$. Hence PBEs of type 1 and 3 cannot exist.

A PBE of type 5 requires that T^w plays n in $t = 1$, and a in $t = 2$. As T^w plays n, G does not move in $t = 1$. Hence T^w's belief at the beginning of $t = 2$ is simply $\mu_\alpha = \alpha + (1 - \alpha)\gamma$. It follows from Lemma 1 that for playing a to be optimal in $t = 2$, it must hold that $\alpha + (1 - \alpha)\gamma \le \theta$. It must moreover hold that T^w does not want to deviate in $t = 1$ when knowing that it will play a anyway in $t = 2$. Its payoff in $t = 1$ is 0 in a PBE of type 5, but $\alpha B^w + (1 - \alpha)A^w$ when deviating and playing a in $t = 1$. Hence T^w would want to deviate unless $\alpha B^w + (1 - \alpha)A^w < 0 \Leftrightarrow \alpha > \theta$. As the two conditions $\alpha + (1 - \alpha)\gamma \le \theta$ and $\alpha > \theta$ cannot hold simultaneously for any γ, a PBE of type 5 cannot exist.

In a second step we show that PBEs of type 2, 4 and 6 can exist, and for each of these PBEs we derive the restrictions on parameters α and γ under which it exists. We denote T^w's expected payoff from the ex-ante perspective in a PBE of type k by $\Pi(k)$. It holds:

$$\begin{aligned}
\Pi(2) &= \alpha B^w + (1 - \alpha)A^w \\
\Pi(4) &= \alpha B^w + (1 - \alpha)[A^w + \gamma B^w + (1 - \gamma)A^w] \\
&= [\alpha + (1 - \alpha)\gamma]B^w + (1 - \alpha)(2 - \gamma)A^w \\
\Pi(6) &= 0
\end{aligned}$$

For a PBE of type 2 to exist, it must hold that $\Pi(2) > \Pi(4) \Leftrightarrow \gamma B^w + (1-\gamma)A^w < 0 \Leftrightarrow \gamma > \theta$; and that $\Pi(2) \geq \Pi(6) \Leftrightarrow \alpha \leq \theta$. It must further hold that G^w does not want to deviate and play d if T plays a in $t = 1$. (Lemma 1 proves that G^w does not want to deviate in $t = 2$.) As T^w plays n in $t = 2$ regardless of G^w's action in $t = 1$, G^w is better off playing c in $t = 1$ since $C^w > D^w$. Hence, a PBE of type 2 exists if and only if $\alpha \leq \theta$ and $\gamma > \theta$.

For a PBE of type 4 to exist, it must hold that $\Pi(4) \geq \Pi(2) \Leftrightarrow \gamma \leq \theta$; and that $\Pi(4) \geq \Pi(6) \Leftrightarrow \alpha \leq \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$. Note that $\frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w} = \psi$ if $\gamma = 0$, and that $\psi \in (0, 1)$ since $A^w > 0 > B^w$. It must further hold that G^w does not want to deviate and play d if T plays a in $t = 1$. (Again Lemma 1 proves that G^w does not want to deviate in $t = 2$.) G^w's expected payoff is $C^w + \gamma D^s + (1-\gamma)C^w$ in this PBE, and $D^w + \beta[\gamma D^s + (1-\gamma)C^w]$ when deviating in $t = 1$. Hence G^w does not want to deviate if $D^w - C^w < (1-\beta)[\gamma D^s + (1-\gamma)C^w]$. As the right-hand side increases in β, G^w does not want to deviate for any β if $D^w - C^w < \gamma D^s + (1-\gamma)C^w$. This condition holds because $D^w - C^w < C^w$ follows from $D^w < 2C^w$, and because $D^s > C^s = C^w$. Therefore, a PBE of type 4 exists if and only if $\alpha \leq \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$ and $\gamma \leq \theta$.

For a PBE of type 6 to exist, it must hold that $\Pi(6) > \Pi(2) \Leftrightarrow \alpha > \theta$, and that $\Pi(6) > \Pi(4) \Leftrightarrow \alpha > \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$. Note that $\theta > \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w} \Leftrightarrow \gamma B^w + (1-\gamma)A^w < 0 \Leftrightarrow \gamma > \theta$. Hence for a PBE of type 6 to exist it must hold that $\alpha > \theta$ and $\gamma > \theta$, or that $\alpha > \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$ and $\gamma \leq \theta$. It must further hold that G^w does not want to deviate and play d if T plays a in $t = 1$. (Again Lemma 1 proves that G^w does not want to deviate in $t = 2$.) As T^w plays n in $t = 2$ regardless of G^w's action in $t = 1$, G^w is better off playing c in $t = 1$ since $C^w > D^w$. Hence, a PBE of type 2 exists if and only if $\alpha > \theta$ and $\gamma > \theta$, or $\alpha > \frac{(2-\gamma)A^w+\gamma B^w}{(2-\gamma)A^w+(\gamma-1)B^w}$ and $\gamma \leq \theta$.

In this proof we have so far shown that there does not exist any PBE in which G^w plays c if T plays a in $t = 1$, other than those listed in Proposition 3. Combined with Proposition 1, this results proves that there does not exist any other PBE at all. □

Appendix B

In this appendix we show that the tie-breaking rules introduced in Sect. 2 are not crucial. It directly follows from Propositions 2 and 3 that any PBE in which weak terrorists mix between attacking and not attacking must be non-generic (i.e., such a PBE can exist only if α or γ happens to be exactly equal to the value of a relevant threshold, but not if this parameter were changed by some $\epsilon \to 0$). Further, Lemma 1 ensures that there exists no PBE in which a weak government mixes in period two, and the following proposition establishes that there exists no PBE in which a weak government mixes in period one.

Proposition 4 *There exists no PBE in which a weak government mixes between retaliating and not retaliating when attacked in period one.*

Proof When T plays a in $t = 1$, the lowest possible lifetime payoff that G^w achieves when playing c in $t = 1$ (given that it plays its best reply in $t = 2$) is $2C^w$, while the highest possible payoff that G^w achieves when playing d in $t = 1$ is D^w. As $2C^w > D^w$, G^w strictly prefers c to d when T plays a in $t = 1$. Hence there exists no PBE in which G^w mixes in $t = 1$. □

Note that Proposition 4 and its proof apply to the baseline as well as the extended version of our model.

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